Appendix D

Rationales for Choice in Public Health: The Role of Epidemiology

André Prost and Michel Jancloes

The decisionmaking process in public health has attracted much attention in recent years. The share of the health and social sectors in public and private expenditure has increased to the point that most systems no longer seem to be affordable either in industrial or developing countries. The importance of the economic factor has meant increasing challenge to the rationale for making decisions only on technical grounds, a process which is deeply rooted in a sector managed by a strong technical constituency and which is backed by emotional moves in public opinion expressed as "Health at any cost" or "Nothing is too expensive for the sake of saving life." New processes are introduced, sometimes reluctantly, in the management of the health sector: determination of priorities; advocacy shifting from effectiveness of technology to that of use; preference given to mass benefits over the satisfaction of individual demand; and so on.

Public opinion on health matters makes sectoral choices more than a policy issue: it makes them a political problem. Final decisions result from the combination of technical judgments, economic feasibility (rarely economic consequences), pressure from lobbies, social and psychological implications, and predominantly circumstantial opportunity. Short-term considerations tend to prevail over long-term implications. It is therefore of the utmost importance to identify criteria for decisionmaking which could introduce some rationality in the decisionmaking process and possibly increase the chances of reaching a consensus among all actors: providers, users, payers, and policymakers.

Attempts to use an economic rationale as the main, or even the sole argument, have been opposed by both health providers and users. They cannot accept the imposition, for financial reasons, of any limitation on the degree of sophistication of the technology on one side, or on the benefits they may enjoy on the other. Thus, no consensus can be reached using cost-benefit or cost-effectiveness analyses.

For the last ten years, epidemiology has been promoted as an alternative tool for decisionmaking in health. Epidemiologists aim at describing health and disease phenomena in population groups, their determinants, and changing patterns over certain periods of time. Epidemiology is the instrument of choice for measuring effectiveness. Background data collected before the intervention constitute a resource which must be elaborated into appropriate information in order to document precisely the changes that have occurred and to demonstrate trends. Epidemiological techniques can also be used to assess unforeseen benefits, provided they are accessible through health and demographic indicators.

This role can be extended to the forecasting of the outcome at the planning stage. Usually, several implementation strategies can fit the design of a project and be considered adequate to meet the stated objectives. It is necessary to select the operational strategy that will maximize the outcome in relation to the input. Cost-effectiveness analyses of this type rely heavily on the accuracy of the epidemiological situation and trend analysis.

In addition, epidemiological assessment takes into account the wide range of relationships and interdependencies within health systems and between health and other sectors. The comparative study of the importance of and interactions between health determinants may bring unforeseen side effects to light. It also shows the effect on the health sector of decisions made in other sectors, such as taxation and financial measures, agricultural and industrial reforms, and, more generally, public policies.

Because epidemiology has become the key factor for evaluation and for effectiveness analyses in health, there has been an increasing tendency to use it at earlier stages of the process, namely at the stages of planning, policy setting, and decisionmaking. The technical method used in this discipline together with its ability to rank priorities and to identify selective programs would seem to reflect the concerns of all the actors and make conclusions readily acceptable. Our aim in this appendix is to analyze the advantages and the difficulties of this approach as well as the challenges that epidemiologists face in making a relevant use of their technique. We argue that, although epidemiology is an essential tool for policy setting, it cannot be the ultimate rationale for decisionmaking in health.

Current Methods

The principal conceptual problem lies in the definition of health indicators which represent the variety of diseases, aggregate the differences among population subgroups, and account for changes over a period of time. A single measure of health status has never been unequivocally accepted; it may even never have existed. Because of this difficulty, analyses have usually been limited to the comparison of two diseases, or to the comparative effectiveness of control strategies for a single disease. The lack of a standard measure of health status considerably hampers the use of epidemiology as an instrument for planning and policy setting.

Two methods have been designed in recent years to interpret conceptually the role of epidemiology in public health. One method uses a quantitative compounded indicator—the number of disability-adjusted life-days—to assess the effect of disease.[1] Thus, results are applied to the process of health resource allocation and management (Ghana Health Assessment Project Team 1981; Morrow, Smith, and Nimo 1982; Romeder and McWhinnie 1977). The ranking of diseases is established by using the average estimated number of healthy days lost in a lifetime as a result of disease episodes. The loss attributable to every single disease is the sum of healthy days lost through acute illness episodes (temporary disability), through chronic conditions and sequelae (partial or complete disablement), and through premature death (considered equivalent to complete disablement). The loss to the community is derived by multiplying the average loss attributable to every single disease by the annual incidence of each disease in the community.

Another method is the "measurement iterative loop" developed at McMaster University, Canada (Tugwell and others 1984). It is a framework intended to guide informed decisionmaking in health. The seven successive steps reflect a logical progression from the assessment of the burden of illnesses through hypothesis generation about the causes of disease, and about the efficiency and the effectiveness of prevention and treatment procedures, to evaluating the effect in a community. It is an approach of a programmatic nature, based on a rational scheme of planning, including an in-depth analysis of sector needs and constraints. Epidemiology is used in the determination of priorities for action, which result not only from the assessment of sectoral needs but also from an assessment of effect, and thereof from cost-effectiveness choices.

Both methods are attractive. They represent valuable contributions to the theory of the decisionmaking process in health. Unfortunately, their application to real situations does not meet the high expectations raised at the conceptual stage. We shall attempt to determine reasons for failure.

Validation of the Results

Quantitative epidemiology uses mathematical tools: averages, percentages, ratios, and so on. The resulting figure, which for practical purposes is one single number, tends to express available information with a degree of precision which far from reflects the confidence limits of the assumptions. The development of computerized systems of data collection and information storage increases the illusion of exactness. It can be misleading, especially for nontechnical people who are unfamiliar with the critical assessment of the validity of results.

For example, suppose an estimated incidence of severe gastroenteritis of 130 cases per 1,000 population per year: a critical assessment should consider whether this figure is based on the records of outpatient visits in health clinics or on a survey of a population sample, whether the result has been adjusted to account for differences in the age and sex distribution between the survey population and the whole population of the country, what recall period was used in the survey, what criteria were used in the definition of "severe cases," how the seasonal variations have been taken into account, and so on. The confidence limits represent the range in which the majority of results from different sources will be included. The value of the assumptions and their confidence limits vary between diseases because of varying levels of precision in the data base and because of differences in the complexity of the epidemiological pattern of diseases.

Striking differences in the ranking of diseases by order of importance can occur, depending on the choice of the upper or the lower limit of the range of use in the calculations. Such ranking also depends on the magnitude of the multiplier effect introduced by the various mathematical formula aiming at the calculation of a synthetic indicator (see note 1).

Validity of Indicators

The ranking of diseases for the determination of priorities necessitates the use of a single indicator to allow for comparisons. Thus, ranking of diseases can be established by using, for example, the death toll, or the incidence in the community, or the degree and duration of the resulting disablement. The selection of the indicator represents a value judgment which may reduce the freedom of the decisionmaker and somehow preempt the decision. Using mortality figures could mean, for example, that the social and economic cost of disablement is obliterated. Using national averages does not allow for the identification of population groups especially deprived or particularly at risk.

The use of a compounded indicator is an attempt to reduce these biases. The method of disability-adjusted life-days (DALDs) combines the effects of mortality, morbidity, and disablement; it uses life expectancy as the reference period. There is no significant bias in the analysis when relatively similar health conditions affecting the same age groups are to be compared. For example, the first mention of this indicator in the literature (Dempsey 1947) was applied to a comparison of mortality due to tuberculosis, heart disease, and cancer; all these diseases are chronic and are prevalent mainly in adults.

More recently, the proposal to use the DALDs lost indicator as a general method for assessing the effect of diseases (Ghana

Health Assessment Project Team 1981) has resulted in more complex combinations. It aggregates not only the effects of mortality, morbidity, and disablement, but also it combines the effect of acute and chronic conditions, in all age groups from birth to death. The authors did not discuss the implicit value judgments of this method. For example, the assumption that "the younger the death, the greater the loss to the community" derives directly from computing the difference between the life expectancy and the age at death. It implies that the death of a child is a greater loss than the death of a young adult in the productive period of his or her life simply because life expectancy for a child is much greater than it is for an adult. It implies for the same reason that maternal mortality is of less consequence to the community than the simultaneous death of the newborn. Also, by definition, the measure assumes that one year of complete disability is equivalent to one year of premature death. It could be argued that meeting the needs of a disabled person places a heavier burden on the community. Finally, mixing together the effects of mortality and morbidity results in minimizing the social and economic cost of common though nonfatal diseases, which may represent up to 80 percent of the workload of outpatient clinics and a large share of drug expenditure.

It is obvious that the aggregation of morbidity and mortality into a single measure necessarily involves making value judgments about the relative weights that should be assigned to each component. The assumption that additional years of life are equally valuable, regardless of the age at which they accrue, conflicts with the common notion that adult mortality is more serious than child death. Weighting procedures may alleviate the difficulty. It can be reflected through the assignment of a zero weight to years of life added before age fifteen, and a weight of one to those added beyond age fifteen. Any other weight could be proposed and discussed. This method of weighting for age preference can be combined with the relative weighting of disability and death, and with weighting for time preference (that is, assigning lower weights to benefits which occur in a distant future). Previous studies have shown that assessments of the effect of a disease and of the effectiveness of a health intervention are very sensitive to the choice of different weights (Prost and Prescott 1984; Barnum 1987). Introducing productivity weights (that is, allocating different weights according to the status of the patient as a producer for the community) has even greater policy implications. Thus, there is no straightforward weighting procedure which could lead to noncontroversial measurements. On the contrary, the selection of weights results from value judgments and therefore carries the risk of further distorting the objectivity of the method.

Quality of the Data

Good quality data bases do not exist in most countries. There is no better consensus on the incidence of home accidents in Europe than on the number of diarrheal episodes in African children. When available, data are often limited to specific diseases and they do not cover the broad spectrum of health disorders. In many developing countries, in the absence of any reliable data base, epidemiologists use assumptions derived from scattered surveys, from incomplete reporting systems, or, even worse, from hospital statistics.

To improve the quality of data, health planners direct considerable effort toward the collection of health statistics. An example is given by the comprehensive epidemiological survey conducted by the health services of Mali with support from the World Bank (Duflo and others 1986). The objective of this survey was to help design a regional health development project. The survey was conducted in a random sample of villages during a period of one month. Specific morbidity and mortality rates were determined and were used to estimate the number of days lost as a result of the diseases observed.

This methodologically sound survey provided an accurate picture of the disease situation, with a reasonable degree of precision. It emphasized the relative importance of neglected pathologies, such as eye diseases, cardiovascular disease, and hemoglobinopathy. It did not, however, change the preliminary ranking of the main diseases (malaria, gastroenteritis, measles, malnutrition, pregnancy complications, respiratory infections) which had been established on the basis of poor quality data available from health providers in the area. It can be argued that data collected at a high cost during the survey have not yielded any better information for the project design. The additional precision in the assessment of the burden of diseases made justification of the project more difficult to challenge. More precise data are of a greater value as a baseline for future evaluation of project benefits. They were not used at the planning stage.

Important in the establishment of a data base is that the system be conceived in relation to the needs of the users or potential users. Too often, data which are critically needed are missing, or they are impossible to retrieve from bulk information. Too many epidemiologists, nationally and internationally, perceive their function as that of collecting the greatest possible amount of information in order to combine all possible variables. In fact, the role of epidemiologists is to tailor the collection of data, using a problem-solving approach, in accordance with hypotheses generated at a preliminary stage.

Comprehensive in Contrast to Selective Care

The ranking of diseases, based on whatever epidemiological indicator is selected, singles out a list of diseases or individual health conditions as the target for control, either because they represent a public health scourge, or because of their socioeconomic effect. Six diseases in Ghana (Ghana Health Assessment Project Team 1981) and eight in Mali (Duflo and others 1986) account for 50 percent of the total number of disability-adjusted life-days lost to the community every year. It seems essential, at first glance, to concentrate all efforts on combating these diseases, or the most important of them, because larger benefits will accrue to the community. Thus, the search for maximum efficiency leads to the development of disease-

oriented programs, using specially designed control methods (case finding, case management, evaluation), selective logistical support, and targeted retraining of staff.

One application of this concept is the Selective Primary Health Care Strategy proposed by Walsh and Warren (1979). The ranking of priority diseases is based on the assessment of their effect in the community and of the effectiveness of available control methods using the implicit value judgment that reducing infant mortality to improve life expectancy is the objective of efficient health services. Therefore, selective primary health care has focused in most cases on diarrhea and diseases preventable by vaccine, and activities have been almost exclusively concentrated on oral rehydration and immunization campaigns.

This strategy is both conceptually and practically misleading. First, it relates cost figures to disease control effectiveness and not to health benefits. It does not consider that the allocation of resources to one activity can have various types of benefits. For example, in an experiment in Zaire, the villages in which successful treatment for intestinal worms had been carried out have shown improvements in immunization compliance, tuberculosis screening, and health education. There was also a decrease in the average number of patient visits to the health facilities (Jancloes 1989). In such a program, parasite control is used as a catalyst to trigger the compliance of the people with health services, and thus to progress toward the real objective of improving the health of every family member.

Second, on the practical side, it is almost impossible, at the peripheral level, to focus on a limited number of diseases. Health services are multivalent by nature. The definition of tasks results from the people's demand for care and from a comprehensive public health strategy which combines the provision of curative care, prevention, hygiene education, and interaction with other sectors that influence health. Patients have been reluctant to use the facilities available in pilot projects set up to test the feasibility of the selective primary health care strategy, mainly because they realized that these facilities could not cover the broad spectrum of their complaints and that they would have to visit another health post for complementary treatment.

Thus, the determination of "priority diseases" is not only misleading with regard to allocative efficiency but it ignores the multisectorality of the health determinants. It ignores observations that some of the most significant progress in health has derived from nonmedical interventions (for example, decrease in infant mortality with rising education levels, historical decrease in tuberculosis incidence before any efficient control method has been available, and so on).

The Demand for Health Services

The perception of health needs by people differ, often strikingly, from the assessment of needs by epidemiologists. Whereas the latter determine risk groups and priority diseases on the basis of various technical criteria (life expectancy, mortality, and the like), communities use a different value system, which places greater importance on individual conditions and on adult morbidity, for example. Whereas epidemiological surveys might conclude that diarrhea and measles are the priority diseases, a sociological survey might reveal, for example, that hernia, hemorrhoids, blindness, and complications of delivery are the priority concerns of the population.

Moreover, the epidemiological method emphasizes the importance of the determinants of diseases, leading to preventive rather than to curative actions. The failure to appreciate the primacy of prevention is now shared by the general public and by a majority of the health profession (Terris 1980). Policies based on an epidemiological rationale are generally opposed by both providers and users of health services. Especially at times of economic stringency, programs of health promotion and disease prevention are easier targets for short-term savings than is specialized curative care. This attitude coincides with the expectations of the consumers and with the dominant position of the health professionals in the curative technical structures.

In almost all cases, an ethical conflict arises between epidemiological and sociological methods. Should planners ignore it, the community will develop sideline channels to meet the demand (private practice, traditional healers, uncontrolled sale of drugs, and so on). The result is the lack of users' commitment to the successful implementation of the program and the absence of a rational use of resources despite intensive planning efforts.

In the case of the Mali project mentioned above, decisionmakers took the demand aspect into account at the initial stage. They considered that ensuring the effectiveness of the referral level in the treatment of adult diseases was essential to the credibility of the program. In a second phase, they took into account the epidemiologically determined needs, with village interventions aimed at reducing child morbidity and mortality.

The Decisionmaking Process

Decisionmakers act on their own judgment as to whether they themselves or the society at large could derive more benefits from the proposed strategy than from competing health interventions (and sometimes nonhealth interventions). The benefits are both those assessed by project evaluation and those perceived subjectively.

Decisionmaking is a complex process which involves a number of determinants: political, sociological, psychological, cultural, economic, technical, sometimes religious, and so on. Opportunity, feasibility, short-term rather than long-term considerations, legal and administrative settings, financing systems, and institutional framework are also essential. Decisionmakers' approval of programs is often lacking because they do not give indirect benefits the same weight as technicians do. In periods of economic stringency, the practical problem is not to determine sectoral priorities but to find politically realistic ways of moving toward greater economic

efficiency in the very short run, considering the role and the power of the actors involved (van der Werff 1986).

Experience has proved that the technical rationale, as provided by, among other things, epidemiological analyses, is relatively low in the hierarchy of factors that influence decisionmaking. The failure of the economic rationality to become the instrument of choice for decisionmaking gives little chance of success to the epidemiological rationality to fulfill this function. Had it been the case, tobacco would have already been banned from the face of the earth.

The comparison of epidemiology with economics as a tool for decisionmaking can be elaborated further in the context of development projects. External assistance sources use efficiency and effectiveness to demonstrate to their constituencies that a high rate of return is obtained. Thus epidemiology is used to quantify health returns and to maximize these returns through appropriate choices at the planning stage. On the other side of the partnership, national authorities and deciders responsible for implementation are sensitive to preferences derived from the value system of the communities. They are in the midst of the ethical conflict described above. Attempts to impose epidemiology as an indisputable tool for decisionmaking, in view of the neutral character of the scientific analysis, are perceived as a limitation to the freedom of judgment, and as a technique to impose targets and objectives which meet the concerns of donors rather than the needs of beneficiaries.

Concluding Remarks

Epidemiological information should be collected as early as possible in public health programs because the quality of any future evaluation depends on the accuracy of baseline data. The lack of such data may hamper the assessment of effectiveness and thus be detrimental to the continuation of activities. There is no alternative to epidemiological methods when evaluating effects on public health.

Epidemiological techniques provide snapshots of the situation as well as indications on trends. They may even allow for a ranking of diseases, using whatever indicator is relevant to the stated objective and provided that associated ethical issues have been properly explored and accounted for. The use of epidemiology for choices in health policy implies a double leap forward: a leap from the ranking of diseases to the setting of priority objectives for action, and a leap from technical priorities to allocating resources on a selective basis.

In both cases, epidemiology alone cannot substantiate the move. The tools used in this discipline are not relevant, and results are often misleading. At the planning stage, objectives are determined on the basis of all the factors involved in the decisionmaking process. The results of epidemiological analyses are to be considered among other factors. The importance of each of these other factors and their interactions should balance the importance of epidemiologically assessed needs. The choice of the epidemiological indicator influences largely the outcome of the results. Thus, these results should not be used to preempt the decision. Epidemiology is not the neutral tool which can lead to unequivocal and unchallengeable choices.

At the beginning of this appendix, we stated that it was of the utmost importance to identify criteria for decisionmaking which could form the basis for a consensus among all actors in the health sector: providers, users, payers, and policymakers. Epidemiology, as a science, is universally praised. Its implications for behavioral changes in users of health services and for the setting of public policies are not readily acceptable unless an intensive educational effort is undertaken. Thus, it is evident that any attempt from the payers and from the deciders to impose policy decisions on the basis of an epidemiological rationality will be rejected. Similar attempts from the health professionals can be opposed by their political and financial partners as a way of preempting the decision for technical reasons. This conflict can be detrimental, because the validity of epidemiology as an analytical tool is at risk to be denied, for reasons of policy implications and not of genuine criticism.

Notes

The authors wish to thank David Parker, Senior Adviser, Health Financing of the United Nations Children's Fund for his extensive review of this chapter.

1. The average number of disability-adjusted life-days lost to the community by each patient with a disease (L) can be calculated as follows (L = Days lost due to [premature death] + [disability before death] + [chronic disability] + [acute illness]):

$$L = (C/100 \times [E(A_o) - (A_d - A_o)] \times 365.25) + (C/100 \times (A_d - A_o) \times D_{od}/100) \times 365.25) + (Q/100 \times E(A_o) \times D/100 \times 365.25) + ([100 - C - Q] / 100 \times t),$$

in which A_o = average age at onset of the disease; A_d = average age at death attributable to the disease; $E(A_o)$ = life expectancy (in years) at age A_o; C = case-fatality rate (expressed as a percentage); D_{od} = percentage of disablement between onset of the disease and each death attributable to it; Q = percentage of permanently disabled among patients who have recovered; D = percentage of disablement of those permanently disabled; t = average period of temporary disablement during acute episodes; I = annual incidence of the disease (new cases per 1,000 population).

As a result, the total loss to the community attributable to cases of the disease occurring in any single year (R) is the total number of days $R = L \times I$ (per group of 1,000 population) (Ghana Health Assessment Project Team 1981).

References

Barnum, Howard. 1987. "Evaluating Healthy Days of Life Gained from Health Projects." *Social Science and Medicine* 24:833–41.

Dempsey, Michael. 1947. "Decline in Tuberculosis: The Death Rate Fails to Tell the Entire Story." *American Review of Tuberculosis* 56:157–64.

Duflo, Bernard, and others. 1986. "Estimation de l'impact des principales maladies en zone rurale malienne." *Revue d'Epidémiologie et de Santé publique* 34:405–18.

Ghana Health Assessment Project Team. 1981. "A Quantitative Method of Assessing the Health Impact of Different Diseases in Less Developed Countries." *International Journal of Epidemiology* 10:73–80.

Jancloes, Michel. 1989. "The Case for Control: Forging a Partnership with Decision Makers." In D. W. T. Crompton and others, eds., *Ascariasis and Its Prevention and Control*. London: Taylor and Francis.

Morrow, R. H., P. G. Smith, and K. P. Nimo. 1982. "Assessing the Impact of Disease." *World Health Forum* 3:331–35.

Prost, A., and N. Prescott. 1984. "Cost Effectiveness of Blindness Prevention by the Onchocerciasis Control Programme in Upper Volta." *Bulletin of the World Health Organization* 62:795–802.

Romeder, J. M., and J. R. McWhinnie. 1977. "Potential Years of Life Lost between Ages 1 and 70: An Indicator of Premature Mortality for Health Planning." *International Journal of Epidemiology* 6:143–51.

Terris, Milton. 1980. "Epidemiology as a Guide to Health Policy." *Annual Review of Public Health* 1:323–44.

Tugwell, P., K. J. Bennett, D. Sackett, and B. Haynes. 1984. "Relative Risks, Benefits, and Costs of Intervention." In K. S. Warren and A. A. F. Mahmoud, eds., *Tropical and Geographical Medicine*. New York: McGraw-Hill.

van der Werff, Albert. 1986. "Planning and Management for Health in Periods of Economic Stringency and Instability: A Contingency Approach." *International Journal of Health Planning and Management* 1:227–40.

Walsh, J. A., and K. S. Warren. 1979. "Selective Primary Health Care: An Interim Strategy for Disease Control in Developing Countries." *New England Journal of Medicine* 301:967–74.

Source: Dean T. Jamison, W. Henry Mosley, Anthony R. Measham, and Jose Luis Bobadilla (eds.). *Disease Control Priorities in Developing Countries*. New York: Oxford University Press for the World Bank. 1993.